



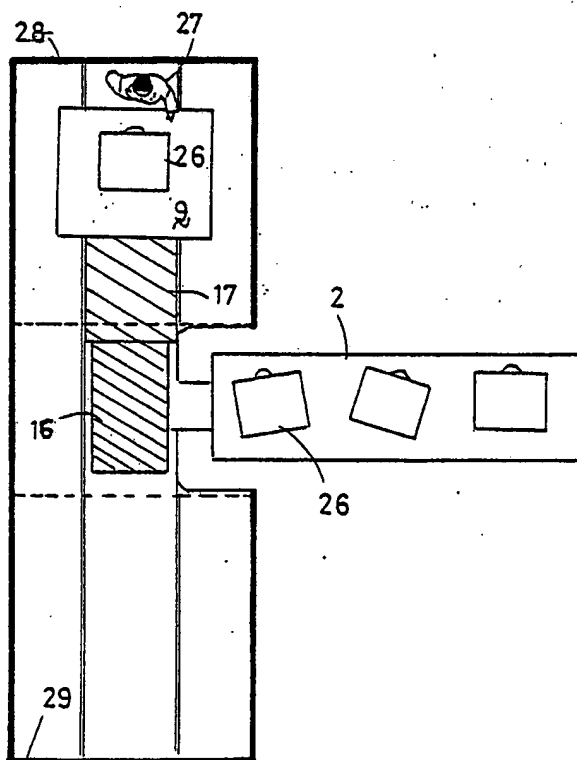
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(54) Title: DEVICE TO FACILITATE THE LOADING AND UNLOADING OF PASSENGERS LUGGAGE INTO AIRCRAFT HOLDS

(57) Abstract

A device to facilitate the loading and unloading of the passengers luggage into and from an aircraft hold which device comprises a wheeled truck provided with a conventional elevating conveyor at the upper end of which a platform is attached which can be introduced into the aircraft hold through a door which is located midway of the hold compartment. The platform is wrapped up on a telescopic outer frame which is slidably wrapped up on a middle frame which is slidably wrapped up on an inner frame which is stationary with respect to the aircraft hold being firmly connected to the wheeled truck. The passenger luggage pieces are successively conveyed by turns along the conventional conveyor and when arrived at the upper end thereof they are discharged on said platform and stopped at the center thereof. The platform is then moved forward and rearward on the aircraft luggage compartment at the command of an operator which stands into the luggage compartment and controls the travel of said platform to stop it where there is a place for stowing the luggage. The outer and middle frames which move the upstanding platform along the aircraft luggage compartment with respect to the inner frame are controlled by four pneumatic rodless pistons.



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A DEVICE TO FACILITATE THE LOADING AND UNLOADING OF
PASSENGERS LUGGAGE INTO AIRCRAFT HOLDS.

The object of the present invention is an automatic device to facilitate the loading and unloading of luggage in and out of an aircraft hold.

5 All the efforts of the designers and engineers in the field of air travel are finalized according to two main directions: to improve the aircraft performances, the safety and the comfort of the aircraft and to improve the ground services which constitute an integrating and indispensable part of the air activity.

10 Among the ground facilities the luggages transportation to the aircraft and their settlement within the aircraft hold are not disregarded with respect to the effectiveness and then to the good quality of the service.

The same should be said about the reverse
15 operations of unloading and sorting the luggages at the end of a flight.

Presently such operations are carried out by means of an elevating truck provided with an endless conveyor which carries the luggages in succession up to
20 the aircraft hold door. At the inside of the hold in an inconvenient position due to the very limited height (which could be less than 80 cm.), two or more operators take up the luggages from the elevating conveyor and arrange them in the hold. This method implies several
25 drawbacks such as the need for equalizing the intervention speeds of the various operators to the speed of the elevating conveyor, the luggages accumulation being consequently caused in addition to the chance of damaging

the luggages and stopping the conveyor itself, the luggage being some times transferred from an operator to another by hurling it.

The purpose of the invention is to realize a
5 device adapted to prevent the above drawbacks so that the arrangement of the luggages within the aircraft hold is made rational, quick and easy.

According to the invention an automatic loading and unloading device is provided which comprises an
10 endless belt platform adapted for receiving from a conventional elevating conveyor various luggage pieces in succession and for disposing them at the level of the hold floor, an assembly of telescopic frames being provided for moving said receiving platform; means being provided for
15 causing said frames to slide along the aircraft hold together with said platform until the latter automatically stops near an operator; means being provided for returning said platform, when empty, to the starting point for receiving a novel luggage after the operator has lifted
20 the luggage for arranging it in a proper position within the hold. Said means for operating the coming and going movement of the platform comprises a contact sensor which acts depending on the operator physical contact so that the coming and going travel is progressively shortened
25 any time the operator proceeds from the hold end wall to the loading door.

Still according to the invention the sliding motion of said telescopic frames is controlled by a series of rodless pistons pneumatically operated which are
30 controlled by a logic circuit which depends on said contact sensor and on a sensor of the luggage presence on said endless conveyor of the platform.

In order to transfer each luggage from the free end of the conventional elevating conveyor to said platform a pneumatic roller is provided which is interposed between the elevator conveyor and the endless belt of the sliding platform which roller fits to contact the last roller of the elevating conveyor together with the first roller of the sliding platform endless belt. Thus the movement of the elevating conveyor is transmitted to said platform and a piece of luggage is transferred onto the platform to reach the center of the latter. As it will be explained hereinafter the platform is then disengaged from the elevating conveyor and by other means hereinafter described it can be moved towards either of the two spaces of the aircraft hold forward and rearward with respect to the hold door.

The invention will be now described with reference to the attached drawings wherein a preferred embodiment thereof is described as an illustration and not as a limitation thereof.

In the drawings:

Fig.1 is a side perspective view of a conventional elevating conveyor which is a constituent part of the device according to the invention and is approached to the luggage hold of an aircraft;

Fig.2 shows a plan view corresponding to Fig.1;

Fig.3 shows the detail of the endless belt platform according to the invention as shown in cross section along plane III-III of fig.2 and in an enlarged scale;

Fig. 4 and 5 show two views similar to figures 1 and 2, said platform being inserted into the luggage hold of the aircraft;

Fig.6 shows in an enlarged scale, the detail A of fig.4;

Figs.7 and 8 show two views similar to Figs.1 and 2 wherein the first luggage piece is arranged on said platform within the hold;

Fig.9 is a view similar to Fig.6 and shows the motion transmission from the elevating conveyor to said platform;

Figs. 10 and 11 show the sliding of the platform along the inside of the hold to reach the operator;

Figs. 12 and 13 show the progressive filling of one of the two spaces of the aircraft hold starting from one end of the hold and reaching the filling door.

Figs.14 and 15 show the beginning of the loading of the luggage into the second space of the hold;

With reference to figures 1 and 2 number 1 indicates the whole of a wheeled truck , of known type, which carries an elevating belt conveyor 2 combined with an hydraulic jack 3, the purpose of which is lifting the upper roller 4 of the elevating belt conveyor up to the level of the floor 5 of the aircraft hold where the luggage 6 is loaded, which hold is located in the lower compartment of an aircraft fuselage; said hold being closed by a door 8.

The device according to the invention comprises an endless belt 9' supported by a platform 9 which is temporarily mounted in continuation to said elevating belt conveyor 2 and which has a breadth such that it can be fitted into the throat 10 at the level of the floor 5 of hold 6.

The device according to the invention is shown in detail in figure 3. The endless belt 9' of platform 9

is mounted on a pair of end rollers 11,12 and on a second pair of transmission rollers 13 which are mounted idle on the side panels 14 of platform 9 which fastened to the outermost frame 18 of a group of three telescopic frames indicated by 16,17,18 which are located underneath the
5 endless belt 9' of platform 9 .

As can be seen in figures 3, 10 and 11 the inner frame 16 is firmly bound to the frame 30 of elevator truck 1 through rods 15 and therefore when platform 9 enters the
10 loading door of the aircraft and stops therein, the frame 16 also stops and defines the moving direction of platform 9 in either directions that is rearward and forward of the aircraft.

In fact the two frames 17 and 18 are wrapped up
15 on stationary frame 16, the frame 17 being slidably wrapped up on frame 16 while frame 18 is slidably wrapped up on frame 17. The successive stretching of frame 17 from frame 16 and of frame 18 from frame 17 is such that the three frames at the maximum of their stretching, extend
20 from the loading door to one or the other end of the luggage compartment.

As shown in Fig.3 the outer surface of frame 18 is wrapped up by platform 9 which is fastened to it and therefore it accompanies the same along the total of its
25 travel. It is to be noted that frame 18 is provided with wheels which run on the floor 5 of the loading compartment of the aircraft.

The displacement of platform 9 in either of the two directions is determined by the stretching of frames
30 17 and 18 in one or the other directions, the movement of these frames depending on a command imparted by an operator who stands within the aircraft hold and is free

to move from one to the other end of the luggage compartment.

The sliding movement of said telescopic frames 17,18 (and then the translation of the platform 9 within the load space) is controlled by four pneumatic rodless pistons indicated by numbers 19, 19', 20 and 21 which are not described in detail inasmuch as they are known and can be found in the trade. The two center pistons 19,19', are associated to the intermediate frame 17, while the two side pistons 20 and 21, the sliding elements of which are each connected with the sliding movement of the contiguous center piston, are respectively associated with the inner frame 16 and with the outer frame 18. Said pistons are all controlled by an operating logics assembly which is also preferably pneumatic and determines from time to time both the travel of the platform within the load space and the two opposite directions of the same travel as it will be better explained hereinafter..

In order to transmit the movement of elevating conveyor 2 to endless belt of platform 9 the system illustrated in Fig.6 is provided . It comprises an idler roller 22 sustained by a pneumatic cylinder 23 which is mounted on arm 24 .

The operation is as follows: the wheeled truck 1 with platform 9 is approached to the aircraft fuselage and the loading door 8 is opened (Fig.1 and 2). Thereafter jack 3 is actuated to bring platform 9 up to the level of the aircraft hold.

The total of the platform 9 including the package of frames 16,17 and 18 and including the battery of four pneumatic rodless pistons 19,19', 20 and 21 is then inserted into the aircraft hold so that the wheels

of telescopic frame 18 are laid down to mate the floor of the aircraft hold.

Subsequently a piece of luggage 26 is disposed in succession with other pieces on the elevating conveyor belt 2 which takes it to the level of the loading hold. The endless belt 9' of the platform 9 is stopped for the moment as illustrated by Fig.6.

As soon as the first piece of luggage 26 has reached the summit of elevating conveyor 2, the engagement of the transmission roller 22 is obtained by means of the pneumatic cylinder 23 (Fig.9) whereby belt 9' of platform 9 starts to run and receives the piece of luggage 26 from conveyor 2. As soon as the piece of luggage 26 reaches the center of platform 9 (Figs. 7 and 8) the assembly of conveyors 2 and 9' stops automatically and platform 9 slides along the inside of the hold (Figs.10 and 11) being actuated by pistons 19,19',20,21 of Fig.3 which determine the extension of telescopic frames 17 and 18.

When platform 9 with piece of luggage 26 has reached the operator 27 which is standing near the end wall 28 of the aircraft hold (Fig.11) then a circuit breaker stops the sliding of the platform 9 and operator 27 lifts the piece of luggage and places it in the hold. Another load sensing circuit breaker feels the luggage taking and operates the return of the empty platform to its original position. Subsequently the cycle is repeated by starting the movement of conveyor 9' of platform 9 and by the arrival of the next luggage piece until the loading of one of the two hold spaces is completed as shown by figure 13.

At the end of the above period the operator actuates a control which inverts the sliding travel of

platform 9 along the aircraft hold and the loading of the second space is initiated, starting from the end wall 29 of the hold as shown in Fig.15. At the end of this second period, the wheeled truck 1 is withdrawn and the aircraft door 8 is closed.

The above operations in the reversed order are effected for unloading the luggage at the end of the flight.

From the above it clearly appears that the described device permits along other advantages, to "humanize" the loading and unloading work inasmuch as the frequency of loading and unloading operations is determined by the operator and not by the speed of the elevator conveyor 2 as it presently occurs. Furthermore the luggage loading and unloading can be effected by a single operator located inside of the hold.

The present invention has been illustrated and described in a preferred embodiment; however it is intended that structural variants can be added thereto without departing from the scope of the present invention.

CLAIMS

1) An automatic device to facilitate the loading and unloading of the passengers luggage into and out of the door of the hold or luggage compartment of the aircraft , which device comprises : a horizontal platform which supports an endless belt in a temporary prosecution to an conventional elevating conveyor of the luggage the purpose of which is to receiving said luggage in succession, an outer wheeled frame adapted for travelling over the aircraft hold bottom; said wheeled frame being connected with said platform by means of telescopic elements ; means for causing said telescopic elements to slide and carry said platform with each luggage on top of it as far as the operator located inside the aircraft hold; a proximity switch for interrupting the platform travel near the operator and a luggage presence sensing switch which controls the return of the platform to its initial position.

2) A device according to claim 1 characterized by the fact that said telescopic elements connecting said outer wheeled frame with said platform comprise an inner frame (16) which is bound to said elevating conveyor and is stationary within said fuselage hold in front of said hold door and a middle telescopic frame (17) wrapped up on inner frame (16) and slidable to extend for all its lenght forwards and rearwards of the luggage compartment, the outer frame (18) being wrapped up on middle frame (17) and slidable to extend for all its lenght from said middle frame (17) forwards and rearwards of the luggage compartment, the stretching of middle frame (17) with

respect to inner frame (16) being controlled by four pneumatic rodless pistons (19,19',20,21) which are actuated by a logical circuit controlled by a detector of a presence of a piece of luggage on the platform belt (9').

3) A device as claimed in claims 1 and 2 wherein the outer surface of the outer frame (18) is wrapped up by said platform (9) which is fastened to it and is provided with an endless belt (9') mounted on a pair of end rollers and on a pair of transmission rollers idly mounted on the platform sides (14).

4) A device according to claims 1-3 characterized by the fact that said device comprises a means for controlling the movement of going and coming of the platform (9) along the luggage compartment of the aircraft which means is adapted for being controlled by the operator whereby the travel of said going and coming movement is progressively shortened and extended.

5) A device as claimed in claims 1-4 characterized by the fact that the return movement of the empty platform (9) to the spot where a next piece of luggage is received to said platform from said elevator conveyor is controlled by a sensor of weight.

6) A device according to claims 1-5 characterized by the fact of being provided with a means for transferring each piece of luggage (26) from conventional elevating conveyor to said platform (9) which means comprises a roller (23) interposed between the upper end of said elevating conveyor and the beginning of said endless belt (9'); said roller being actuated by a pneumatic jack.

7) A device according to claims 1-6 characterized

by the fact that said platform endless belt (9') is provided with a sensor of weight adapted for interrupting the movement of said endless belt as soon as said piece of luggage has reached the center of said platform within the inside of the aircraft hold.

8) A device according to claims 1-7 characterized by the fact of being provided with a control for inverting the coming and going movement of said platform along the aircraft luggage compartment whereby the two rearward and forward spaces of said compartment can be filled by the operator with passengers luggage.

9) A device according to the claims 1-8 characterized by the fact that said four rodless pistons are pneumatically operated and laying coplanar within the space defined by said inner, middle and outer telescopic frames of which pistons two (19,19') are central with respect to the other two (20,21) and are fastened to the middle frame while the other two are lateral and are associated respectively with the inner frame and with the outer frame, the mobile frame of said lateral pistons being fastened to the mobile frame of the adjacent central piston.

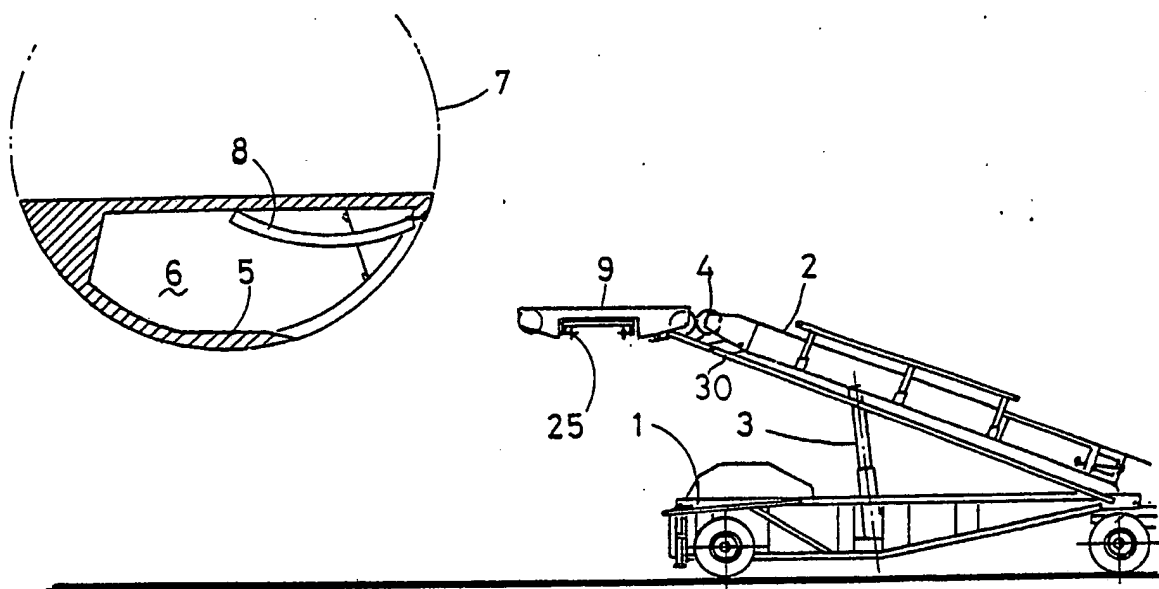


FIG. 1

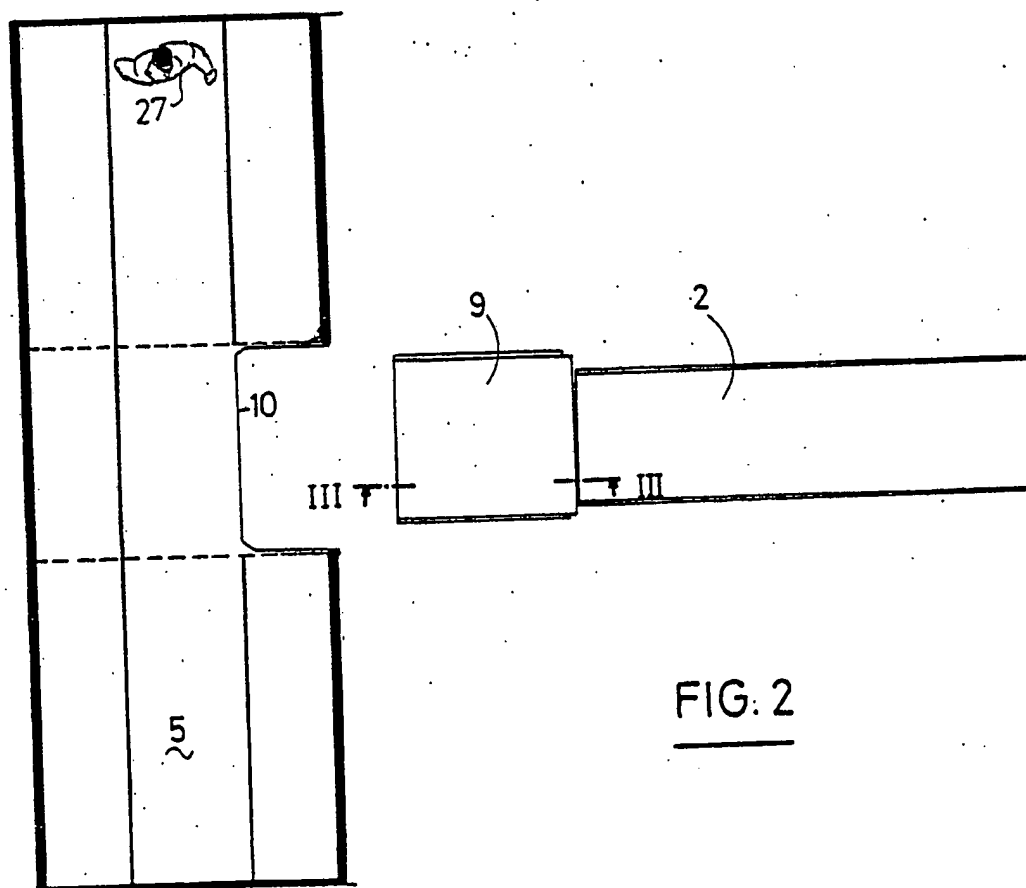


FIG. 2

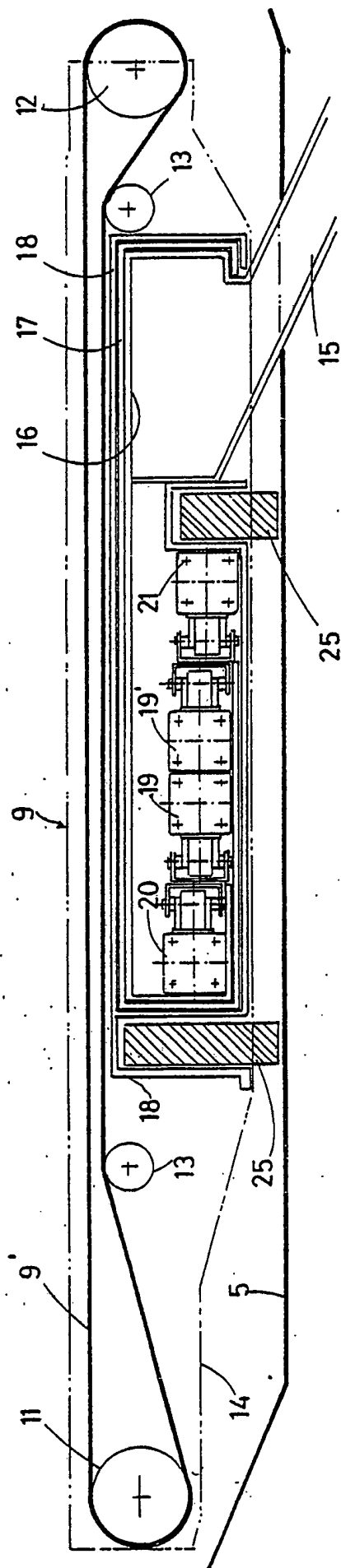


FIG. 3

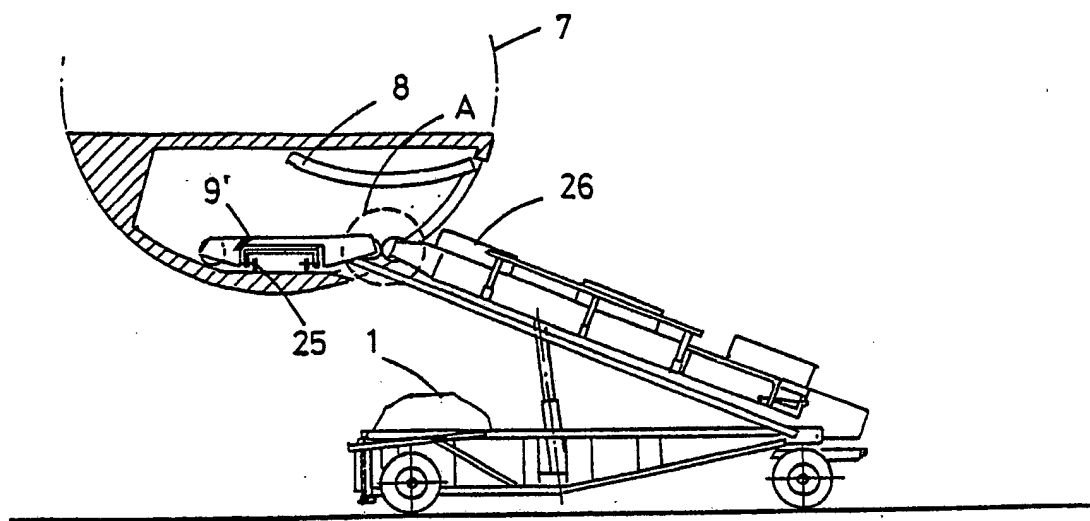


FIG. 4

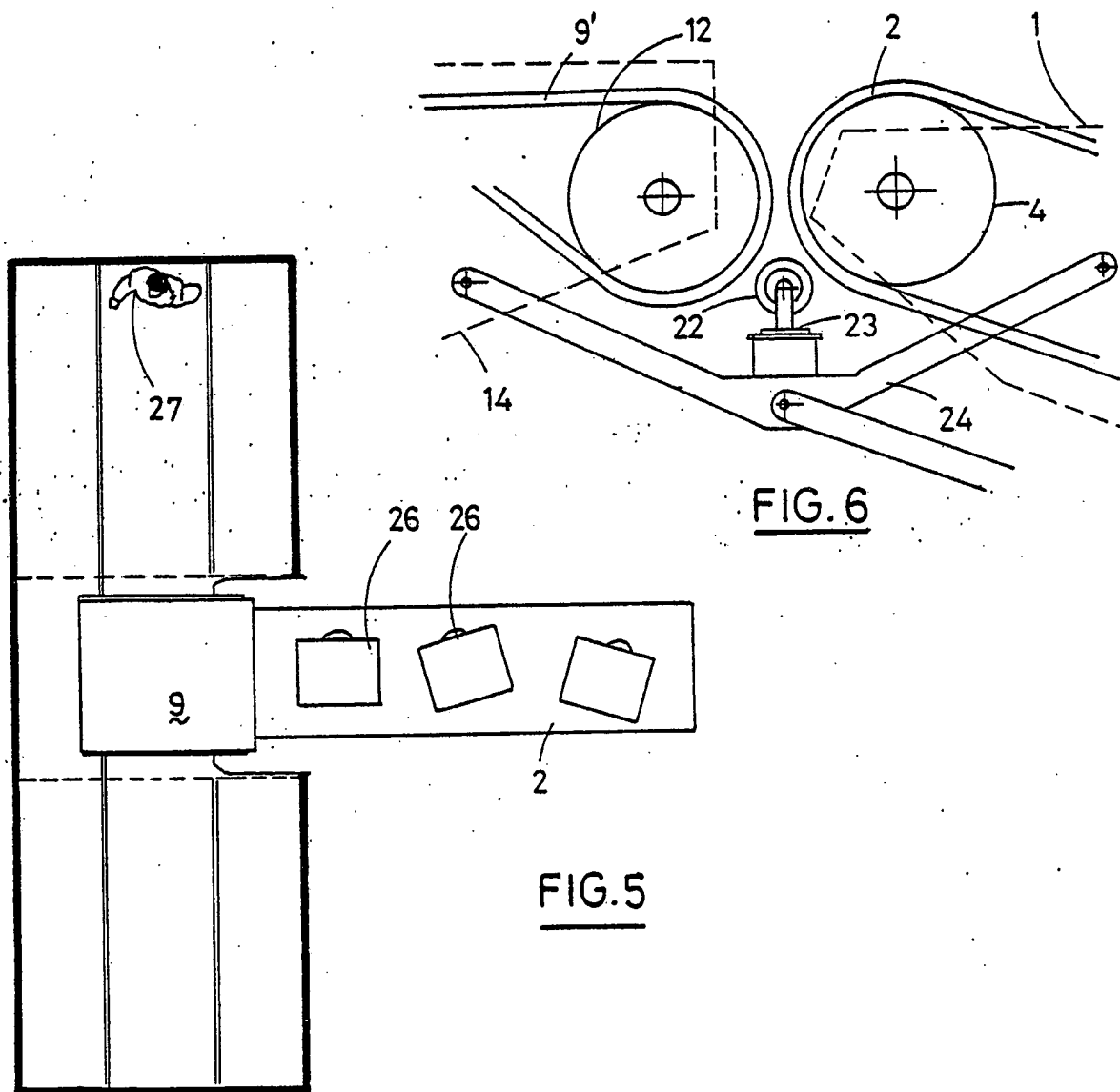


FIG. 6

FIG. 5

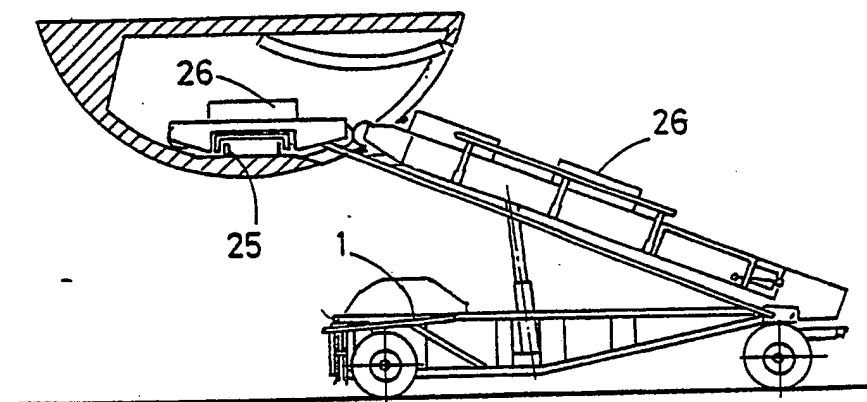


FIG. 7

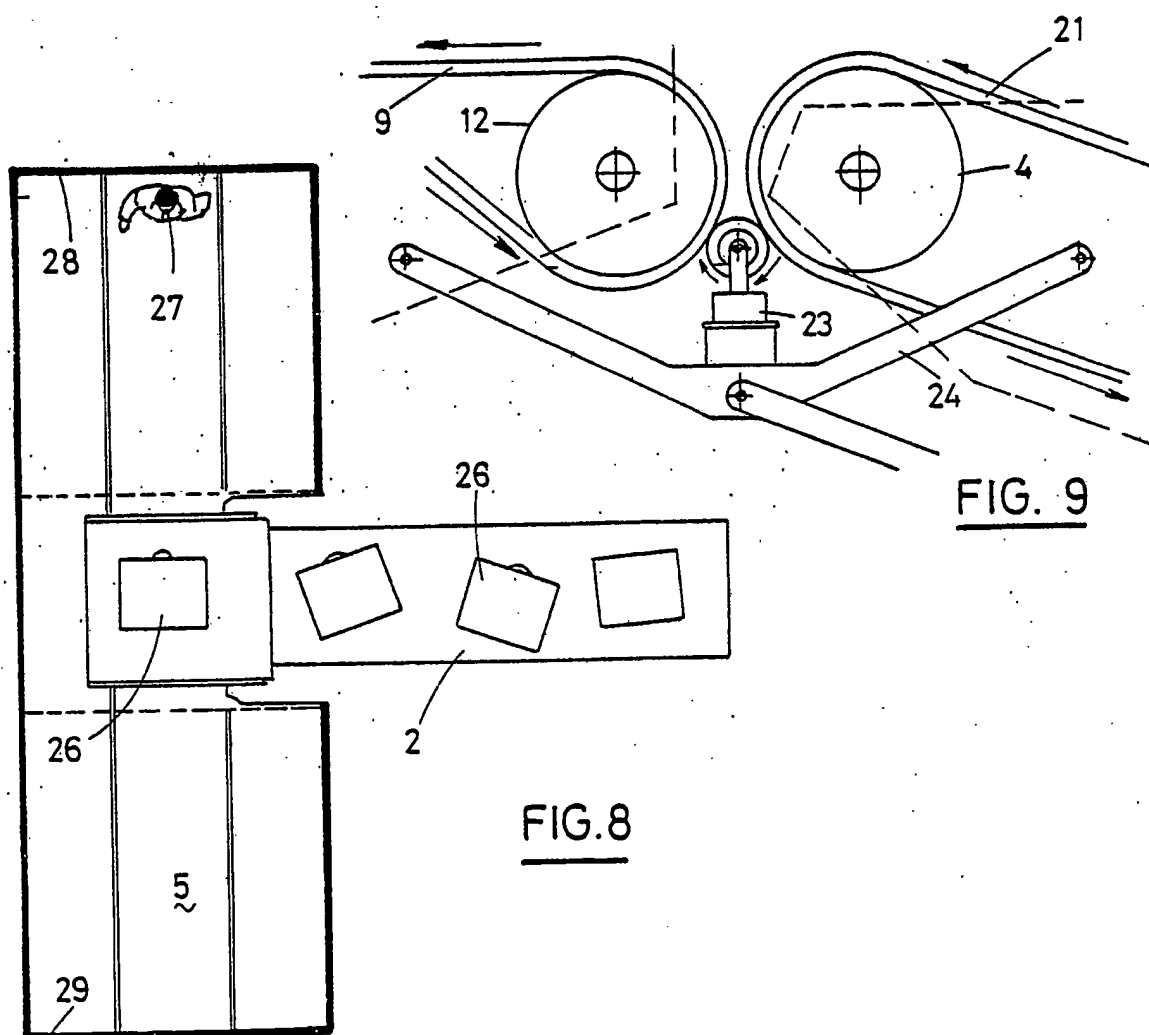


FIG. 9

FIG. 8

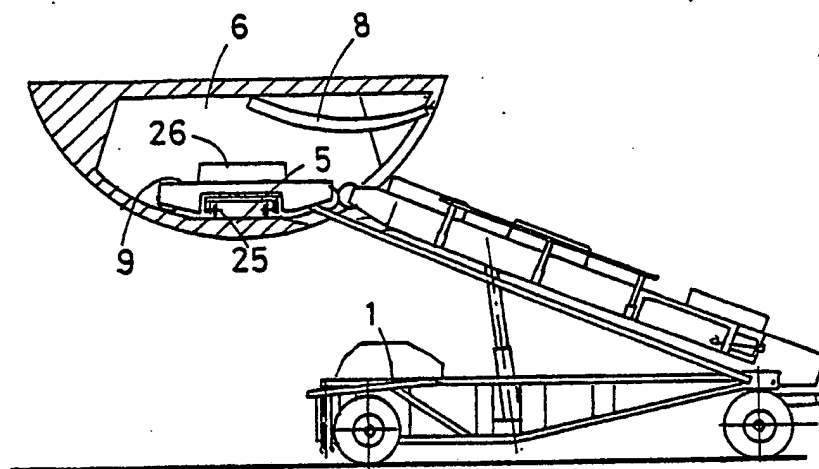


FIG. 10

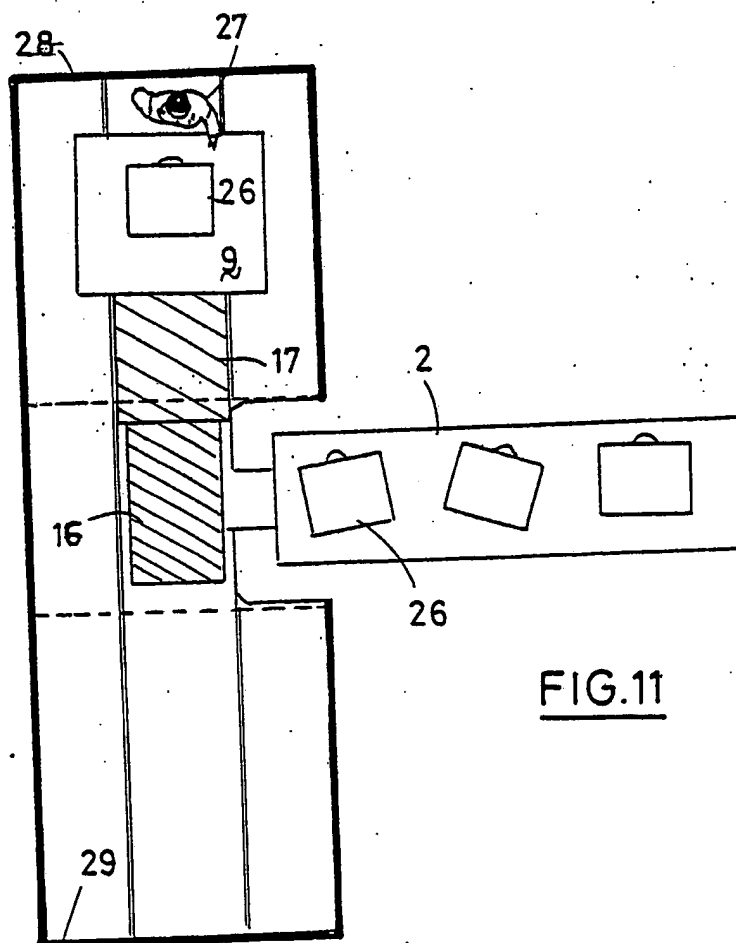


FIG. 11

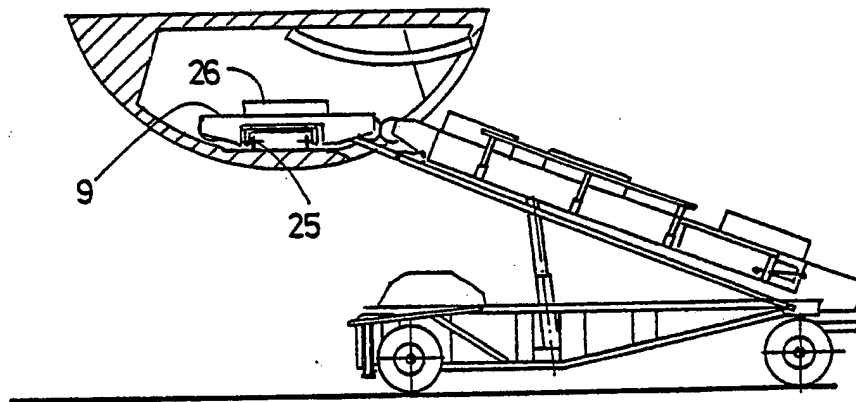


FIG. 12

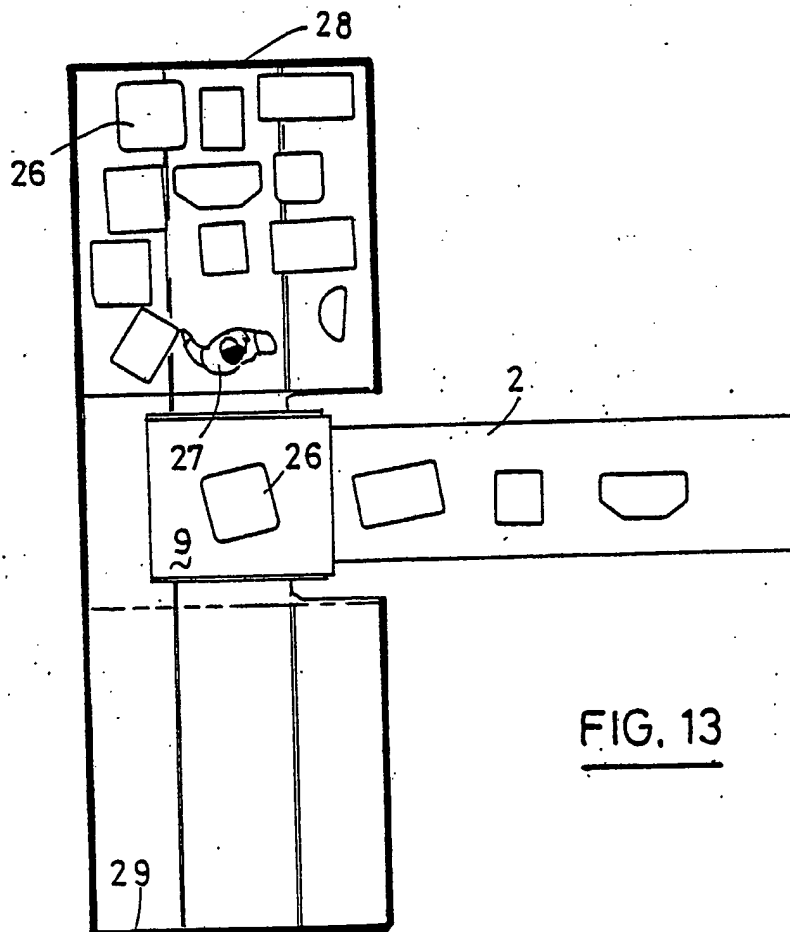


FIG. 13

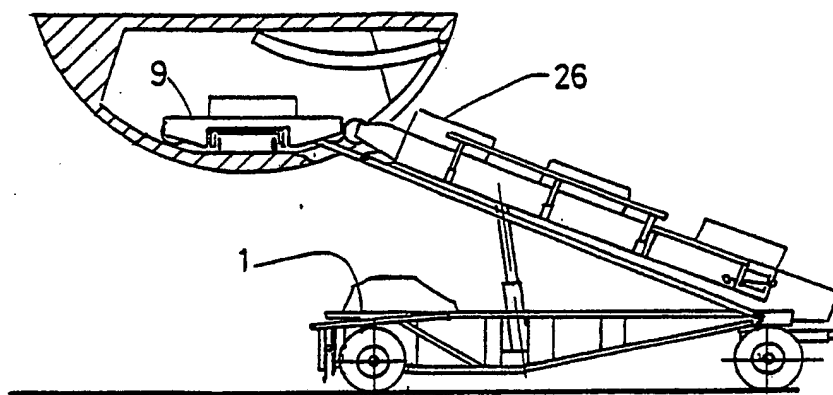


FIG. 14

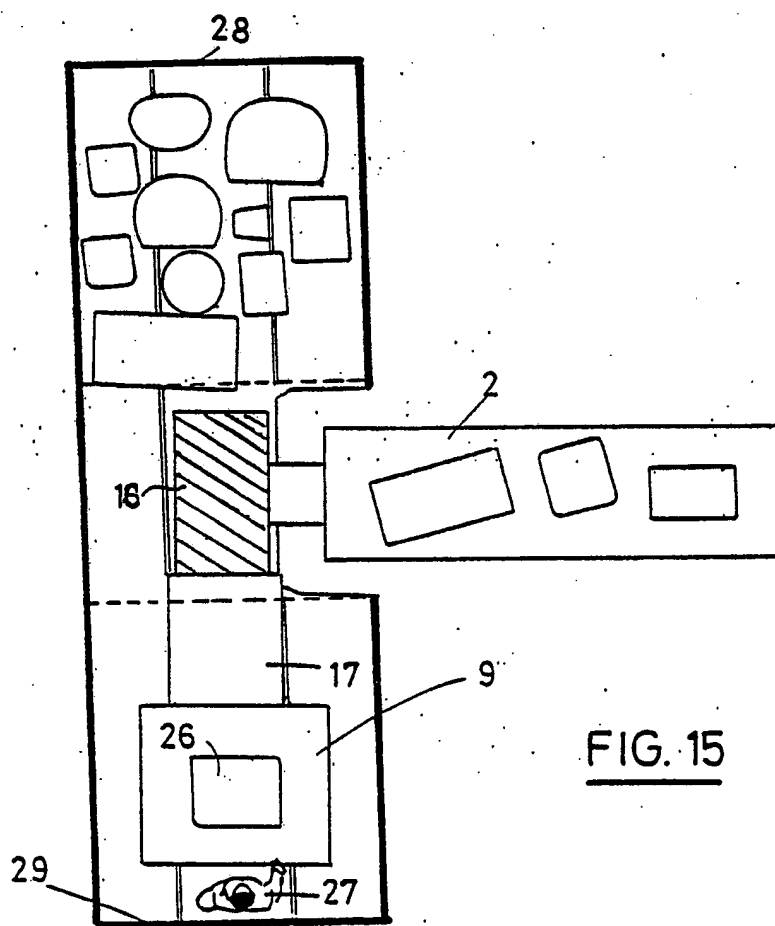





FIG. 15

INTERNATIONAL SEARCH REPORT

International Application No PCT/IT 88/00067

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC IPC ⁴ : B 64 F 1/32; B 64 D 9/00; B 65 G 67/08														
II. FIELDS SEARCHED <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Minimum Documentation Searched ⁷</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 25%; border-bottom: 1px solid black;">Classification System</th> <th style="border-bottom: 1px solid black;">Classification Symbols</th> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">IPC⁴</td> <td style="padding: 5px;">B 64 C; B 64 D; B 64 F; B 65 G</td> </tr> </table> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Documentation Searched other than Minimum Documentation to the extent that such Documents are included in the Fields Searched ⁸</div>			Classification System	Classification Symbols	IPC ⁴	B 64 C; B 64 D; B 64 F; B 65 G								
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IPC ⁴	B 64 C; B 64 D; B 64 F; B 65 G													
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹ <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 10%; border-bottom: 1px solid black;">Category ⁹</th> <th style="width: 70%; border-bottom: 1px solid black;">Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²</th> <th style="width: 20%; border-bottom: 1px solid black;">Relevant to Claim No. ¹³</th> </tr> <tr> <td style="border-right: 1px solid black; text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="border-right: 1px solid black; padding: 5px;">FR, A, 2318811 (ETS. M. CHAPUIS) 18 February 1977 see page 5, line 34 - page 6, line 21 --</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1</td> </tr> <tr> <td style="border-right: 1px solid black; text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="border-right: 1px solid black; padding: 5px;">EP, A, 0263540 (THE BOEING CO.) 13 April 1988 see abstract --</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1</td> </tr> <tr> <td style="border-right: 1px solid black; text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="border-right: 1px solid black; padding: 5px;">CH, B, 468917 (AMERICAN SUGAR CO.) 15 April 1969 see figure 1; column 3, lines 15-56 -----</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1</td> </tr> </table>			Category ⁹	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³	A	FR, A, 2318811 (ETS. M. CHAPUIS) 18 February 1977 see page 5, line 34 - page 6, line 21 --	1	A	EP, A, 0263540 (THE BOEING CO.) 13 April 1988 see abstract --	1	A	CH, B, 468917 (AMERICAN SUGAR CO.) 15 April 1969 see figure 1; column 3, lines 15-56 -----	1
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A	EP, A, 0263540 (THE BOEING CO.) 13 April 1988 see abstract --	1												
A	CH, B, 468917 (AMERICAN SUGAR CO.) 15 April 1969 see figure 1; column 3, lines 15-56 -----	1												
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>¹⁰ Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 50%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"A" document member of the same patent family</p> </div> </div>														
IV. CERTIFICATION <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-bottom: 1px solid black; padding: 5px;">Date of the Actual Completion of the International Search</td> <td style="width: 50%; border-bottom: 1px solid black; padding: 5px;">Date of Mailing of this International Search Report</td> </tr> <tr> <td style="border-bottom: 1px solid black; padding: 5px;">29th December 1988</td> <td style="border-bottom: 1px solid black; padding: 5px; text-align: center;">20. 01. 89</td> </tr> <tr> <td style="border-bottom: 1px solid black; padding: 5px;">International Searching Authority</td> <td style="border-bottom: 1px solid black; padding: 5px;">Signature of Authorized Officer</td> </tr> <tr> <td style="padding: 5px; text-align: center;">EUROPEAN PATENT OFFICE</td> <td style="padding: 5px; text-align: center;">  P.C.G. VAN DER PUTTEN </td> </tr> </table>			Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	29th December 1988	20. 01. 89	International Searching Authority	Signature of Authorized Officer	EUROPEAN PATENT OFFICE	 P.C.G. VAN DER PUTTEN				
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International Searching Authority	Signature of Authorized Officer													
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**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

IT 8800067
SA 24384

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 12/01/89. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		GB-A- 1550156	08-08-79
EP-A- 0263540	13-04-88	US-A- 4780043	25-10-88
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		GB-A- 1106263	